EP 38061

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 3:
A61B 17/11

A1

(11) International Publication Number: WO 81/00668

(43) International Publication Date: 19 March 1981 (19.03.81)

(21) International Application Number: PCT/NL80/00029

(22) International Filing Date: 5 September 1980 (05.09.80)

(31) Priority Application Number: 7906691

(32) Priority Date: 7 September 1979 (07.09.79)

(33) Priority Country: NL

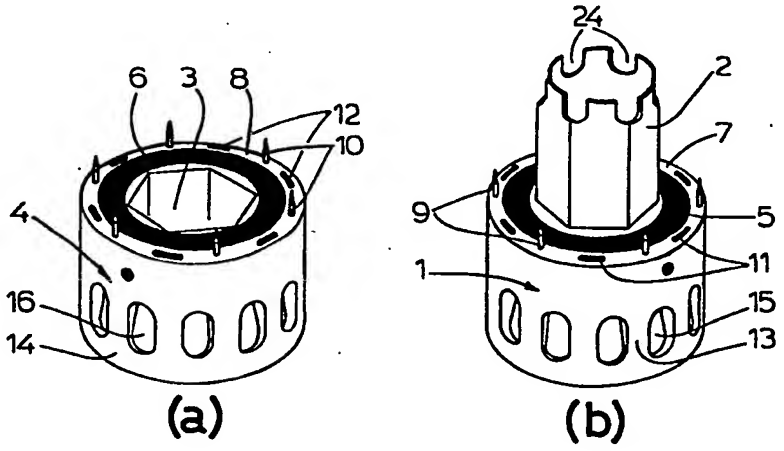
(71) Applicant; and
(72) Inventor: JANSEN, Anton [NL/NL]; Neerkanne 32, NL-1083 AN Amsterdam (NL).

(74) Agent: DE VRIES, Johannes, Hendrick, Fokke; Weteringschans 96, NL-1017 XS Amsterdam (NL).

(81) Designated States: DE, FR (European patent), GB, NL, US.

Published
With international search report
In English translation (filed in Dutch)

(54) Title: MEDICAL DEVICE FOR CONNECTING TWO PORTIONS OF THE INTESTINE, ANCILLARY DEVICE FOR USE THEREWITH, AND METHOD FOR INSERTION OF AN INTESTINAL BUTTON SUTURE WITH THE AID OF THIS DEVICE



(57) Abstract

A medical device (1, 4) for connecting two portions of the intestine, consisting of two coupling components (1, 4, respectively) which can be connected with each other, which can be inserted in the respective ends of the two parts of the intestine, and between which - in the coupled state - these ends of the intestine can be clamped. The coupling components (1, 4) comprise connecting means which are provided with a projecting pin (2), connected with the first coupling component (1), and which fits into a continuous central aperture (3) formed in the second coupling component (4), and fixing means (5, 6) which holds the second coupling component (4) - in the coupled state - pressed against the first coupling component (1), while clamping the intervening ends of the intestine. The projecting pin (2) is made hollow internally with an internal dimension which is at least 1/3 of the external dimension of the first coupling component (1), the said cavity traversing the entire length of coupling component (1). The pin (2) has a sliding fit in the central aperture (3). The fixing means consisting of magnets (5, 6) are located in the parts of the coupling components (1, 4) which face each other in the coupled state, adjacent to the projecting pin (2) in the first coupling component (1), and adjacent to the central aperture (3) in the scond coupling component (4), respectively.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	**KP**	Democratic People's Republic of Korea
AU	Australia	**LI**	Liechtenstein
BR	Brazil	**LU**	Luxembourg
CF	Central African Republic	**MC**	Monaco
CG	Congo	**MG**	Madagascar
CH	Switzerland	**MW**	Malawi
CM	Cameroon	**NL**	Netherlands
DE	Germany, Federal Republic of	**NO**	Norway
DK	Denmark	**RO**	Romania
FI	Finland	**SE**	Sweden
FR	France	**SN**	Senegal
GA	Gabon	**SU**	Soviet Union
GB	United Kingdom	**TD**	Chad
HU	Hungary	**TG**	Togo
JP	Japan	**US**	United States of America

Medical device for connecting two portions of the intestine, ancillary device for use therewith, and method for insertion of an intestinal button suture with the aid of this device

The invention relates to a medical device for connecting two portions of the intestine, consisting of two coupling components which can be connected with each other, which can be inserted in the respective extremities of the two portions of the intestine, and between which - in the coupled state - these intestinal extremities can be clamped, the said coupling components comprising coupling means which are provided with a projecting pin, which is connected with the first coupling component, which pin fits into a continuous central aperture formed in the second coupling component, and fixing means which keep the second coupling component, in the coupled state, pressed against the first coupling component, while clamping the intervening ends of the intestine. The invention further relates to an ancillary device for use therewith and a method for the insertion of an intestinal button suture with the aid of this device.

Such a medical device is known from US patent 2,434,030. In the case of the device described in this patent the connection between the two portions of the intestinal button suture can only be made and maintained by manipulation of the portion of one of the components which projects outside the body of the patient. As a result the application of this known design is restricted to rectum/colon anastomosis. Furthermore this device suffers from the disadvantage that during convalescence the device remains projecting outside the body, so that there is a danger of damage to the portion of the colon which is still vulnerable. Furthermore the device has to be adjusted and regulated by feel.

In Dutch patent 82,213 an improvement to this device is proposed, whereby operations other than rectum/colon anastomosis can be performed. In fact, however the device described therein is suitable particularly for couplings between portions of the intestine of the oesophagus, but has little advantage for the insertion of intestinal sutures with rectum/colon anastomosis.

The invention aims at providing a medical device of the above-mentioned type capable of universal application for all types

of intestinal sutures, which is extremely easy to employ, which is extremely light, and which can easily leave the body and furthermore ensures efficient healing of the intestine.

For this purpose the device in accordance with the invention is characterised in that the projecting pin of the first coupling component is made internally hollow, with an internal dimension which is at least 1/3 of the external dimension of the first coupling component, said cavity traversing the entire coupling component, wherein the pin has a sliding fit in the central aperture in the second coupling component, while the fixing means consist of magnets which are located in the parts of the coupling components, which face each other in the coupled state, adjacent to the projecting pin in the first coupling component and adjacent to the central aperture in the second coupling component, respectively.

Although, as a result of the flexibility of the intestinal wall, the cross sectional profile of the coupling components is not an essential item, it is evidently of advantage, both from the manufacturing and the manipulation viewpoints, to make the coupling components rotationally symmetrical. More particularly the manipulation of the two coupling components in the intestinal extremities is rendered easier if both coupling components are rings with a cylindrical external surface and with the same ring diameter. As a result manufacture of the device is simple if the magnets in the coupling components are made ring-shaped with an external diameter equal to or less than the external diameter of the corresponding coupling component, and with an internal diameter larger than the largest pin diameter.

The thickness of the ring-shaped magnets does not need to be equal to the axial length of the coupling portions. Since, in order to exert their effect, the magnets must be as close as possible to the end faces of the two ring-shaped coupling components which must face each other, and since only that portion which is located close to the end face contributes essentially to the closure force exerted by the device, the axial length of the coupling components is greater than the thickness of the magnets.

To prevent overturning during manipulation, the axial length of the casing of the actual coupling components should preferably be greater than the thickness of the magnets. However, in order to prevent

residues of tissue, waste materials and the like concentrating between the wall of the intestine and the casing surface of the coupling components, it is advantageous if apertures are recessed in the magnet--free portion of the cylindrical casing of the coupling components which faces away from the end faces. Furthermore, these apertures contribute towards a reduction in weight, which is important, because pressure due to the weight of the device during convalescence can result in damage (bed sores).

As regards stimulation of good healing of a wound, it can be harmful if twisting of the intestinal button suture can occur. In accordance with a preferred embodiment of the invention the pin and the central aperture are given such a profile that the central aperture of the second coupling component can be pushed over the pin of the first coupling component without rotation around its axis occurring. In particular the external profile cross section of the pin and the internal profile cross section of the central aperture have the form of a regular polygon, especially a hexagon. The hexagon shape has advantages for manufacturing purposes, but it is naturally also possible to employ forms of other polygons or grooves, ribs, etc., although as a rule these are admittedly inefficient by nature.

In accordance with a preferred embodiment of the invention the pin is provided at its end with an outwardly-projecting rim, longitudinal slots being provided in this end, wherein the central aperture in the coupling section at some distance from the end face has a broad-end portion, the dimension of which is greater than that of the rim of the pin, while the distance from the projecting rim of the pin to the end face of the first coupling component is 2-6 mm greater than the said distance from the broadened portion of the central aperture to the end face of the second coupling component.

This ensures that when a coupling is made before the magnets can exert a satisfactory coupling force, the two coupling components can no longer part, provided that the rim of the pin has reached the broader portion of the central aperture.

The coupling components may be manufactured from any material which is inert in the body and which does not give rise to tissue reactions. However, the coupling components are intended to remain only temporarily in the body and, after healing of the wound (whereby

the tissue clamped between the rings dies) the coupling device works loose from the wall of the intestine and is removed by a natural path together with the faeces.

A suitable material for the body of the coupling components is an inert plastic material which can be extruded. A suitable plastic material is, for example, a polyester polyethylene terephthalate.

The magnets should preferably be made from polymer-combined rare earth cobalt alloys, because in the non-magnetised state these materials can be easily machined.

As a result of its simplicity of construction and its low weight the device in accordance with the invention is excellently suitable for making faultless intestinal sutures, whereby above all the danger of post-operative complications is considerably reduced. The device can be employed at all locations in the human body where intestinal resections are required, as in the oesophagus, the thin intestine, the thick intestine and the colon.

However, colon/intestine resections are among the most difficult operations, because frequently only a short section is left of the colon which lies deeply concealed in the abdomen. Manipulation is difficult at this point.

The invention similarly aims at providing an ancillary device for this type of operation, whereby colon anastomosis can be made easier.

For this purpose this ancillary device in accordance with the invention is characterised by a seating knob, on which the end facing away from the end face of the second coupling component can be placed, a knob which is rounded at its front end and which can be placed on the end face of the second coupling component, wherein the seating knob, the second coupling component and the knob, in the assembled state, form a continuous cylinder and - in the assembled state - can be introduced into a portion of the intestine in the patient's body by means of an insertion pin.

In order to undertake colon anastomosis, in accordance with a first embodiment of the invention, the seating knob is screwed onto the insertion pin, wherein subsequently the knob can be attached to the seating knob with the second coupling component between them. This provides a smoothly fashioned entity which is introduced rectally into

the stump of the colon by means of the insertion pin until the rounded knob appears at the abdomen side. Then, from externally, the coupling between the rounded knob and the seating knob is loosened and the rounded knob is removed. In accordance with the invention an extension rod can now be fastened to the seating knob, the said extension rod having the same external profile cross section as the projecting pin of the first coupling component, and one end of which can be inserted in the cavity of the pin, wherein stop means are provided for fixing the precise mutual position of the pin and the extension rod. Then the suture which is arranged around the end of the intestine is tightened until the end of the intestine contacts with the extension rod which now projects upwards into the abdominal cavity. By means of the insertion pin the coupling component is now pressed upwards, by means of which it is more easily reached by the operator, who now by hand brings the coupling component with the projecting pin already inserted in the other end of the intestine towards the projecting end of the extension rod, and, in the right position, pushes the projecting pin onto the extension rod. Whilst the operator now, with one hand, holds one end of the intestine and with the other hand holds the other end of the intestine, the surgical assistant slowly pulls the insertion pin with the seating knob fastened thereto and the extension rod fastened thereto downwards and out of the body of the patient, as a result of which the two coupling components approach each other without any mutual twisting being possible. Ultimately only the two coupling components are left behind in the body, with the ends of the intestine clamped between them.

To prevent the second coupling component from overturning after removal of the rounded knob from the seating knob, before the extension rod has been attached to the seating knob, in accordance with a particularly favourable embodiment of the ancillary device of the invention, the knob can be attached to a first end of the insertion pin, wherein the seating knob forms the front end of a cylindrical sleeve, in which the insertion pin is slidably in such a manner that the insertion pin can be pushed through the central aperture of the coupling component placed on the seating knob. With this embodiment no interchanging of the rounded knob and the extension rod needs to take place and the second coupling component is held in the precise

position on the seating knob by means of the insertion pin.

In this case preferably the first end of the insertion pin can be inserted in the cavity of the projecting pin of the first coupling component, wherein a portion of the insertion pin which extends from this end possesses the same external profile cross section as the pin. In accordance with the invention the first end of the insertion pin portion can be detachably fastenable in the cavity of the projecting pin of the first coupling portion, whereby the coupling of the two coupling components is considerably simplified.

The invention also comprises a procedure for provision of an intestinal suture with the aid of a device in accordance with the invention, characterised by the fact that after resection of the intestine the mucosa and the sub-mucosa are separated from the surrounding muscular layer, which is removed over a distance of several millimetres, after which the two coupling components are applied in the ends of the intestine and only the mucosa and sub-mucosa layers are clamped between the two coupling components.

The invention will be described in greater detail in the following by reference to the drawings, in which some embodiments of the medical device in accordance with the invention are shown.

Fig. 1 is a perspective view of a first embodiment of the medical device in accordance with the invention, in which the coupling components can be seen in the coupled state.

Fig. 2 is a side view of the device as shown in fig. 1.

Fig. 3 is a perspective view of the end face of the coupling portions in the non-coupled state.

Fig. 4 is a partial view of an ancillary device in accordance with the invention, with the second coupling component attached thereto.

Fig. 5 shows the ancillary device as in fig. 4 after removal of the rounded knob and attachment of the extension rod.

Figs. 6-8 show further phases of the use of the device as in fig. 4 in order to make a connection between the two coupling components.

Figs. 9-16 illustrate phases in the execution of a colon operation using the devices shown in figs. 1-8.

Fig. 17 is a perspective view of the end face of a second

embodiment of the medical device in accordance with the invention.

Fig. 18 is a perspective view of a third embodiment of the medical device in accordance with the invention, where only the second coupling component is visible.

Figs. 19a-19e illustrate an alternative embodiment of the ancillary device in accordance with the invention, together with the use thereof.

The medical device shown in figs. 1-3 in accordance with the invention consists of a first coupling component 1 with a projecting pin 2, which is hollow internally, and which fits into a central aperture 3 of a second coupling component 4. The internal dimension of the hollow pin 2 is at least one third of the external dimension of the first coupling component. The cavity in the pin 2 extends throughout the entire coupling component 1. In figs. 3a and 3b the two coupling components 1, 4 are illustrated in the non-connected state, which indicates that ring-shaped magnets 5 and 6 are located in the end faces 7, 8, respectively, of the coupling components 1, 4. With this embodiment, adjacent to the magnets 5, 6 in the end faces 7, 8, pointed pins 9, 10 and apertures 11, 12 are provided, wherein the apertures in one coupling component serve to accommodate, in the connected state, the projecting pins of the second coupling component, and conversely.

As shown in fig. 3, the external profile cross section of the pin 2 and the internal profile cross section of the central aperture 3 have the form of a regular hexagon, so that the second coupling component 4 can be pushed, by means of its central aperture 3, over the pin 2 of the first coupling component 1, without rotation occurring. This prevents any twisting of the intestinal suture. Both of the coupling components 1, 4 have a cylindrical casing 13, 14, respectively, having the same ring diameter. The external diameter of the magnets 5, 6 is less than the external diameter of the coupling components 1, 4, but if desired can be equal thereto. Naturally, the internal diameter of the magnets is greater than the largest pin diameter. Furthermore, the axial length of the coupling components 1, 4 is greater than the thickness of the magnets 5, 6.

Apertures 15, 16 are provided in the portion of the cylindrical casing 13, 14 of the coupling components 1, 4 which is free from magnetic material, said apertures 15, 16 having a double purpose.

First of all they serve to discharge waste material which can be present between the wall of the intestine and the device, and secondly these apertures 15, 16 provide a desirable saving in weight. For good wound healing it is always of great importance that as little pressure as possible is exerted on the portion of the intestine to be healed. One difficulty with the devices hitherto has been especially their considerable weight, which on numerous occasions has given rise to damage to the intestine as a result of bed sores. By the provision of the lateral apertures 15, 16 the weight of the said devices is reduced, whereby the risk of damage to the intestine has been considerably reduced.

Figs. 4-8 illustrate an ancillary device for the attachment of the medical device as shown in figs. 1-3 for colon anastomosis. As shown in fig. 4, the ancillary device comprises an insertion pin 17, to the end of which a seating knob 18 can be attached by means of a screw thread connection. At its top the seating knob 18 is provided with a seating 19 (see fig. 7 or 8), onto which the end of the second coupling component 4 which faces away from the end face 8 can be placed. By means of the second coupling component 4 a rounded knob 20 can be attached to the seating knob 18 by means of a screw thread connection, so that the end face 8 with the pins 10 is terminated by the knob 20.

After insertion into the body of the patient the knob 20 is unscrewed and removed. Subsequently, an extension rod 21 is attached to the xxx seating knob 18, thus resulting in the state shown in fig. 5. This extension rod 21 has the same external profile cross section as the projecting pin 2 of the first coupling component 1, and its free end 22, which is rounded, is capable of insertion in the cavity of the pin 2. At the transition from the round end 22 in the hexagonal portion of the extension rod 21 a stop cam 23 is located which fits into corresponding recesses 24 (figs. 3b, 6) in the projecting end of the pin 2.

Fig. 6 illustrates the situation which is achieved after the extension rod 21 is pushed with its end 22 into the cavity of the pin 2. By means of the adjustable stop means 23, 24 the precise position of coupling component 1 can be adjusted. Subsequently, by lowering the coupling component 1, the extension rod 1 is pushed through the central aperture 3 in the coupling component 4 (fig. 7), whereby ultimately the coupling component 4 reaches the projecting pin 2 of coupling

component 1 and slides over this until a connection is achieved between the two coupling components 1, 4 as a result of the magnetic force of magnets 5, 6 (fig. 8).

The procedure for employing the coupling components 1, 4 will now be discussed in greater detail with reference to figs. 9-16.

Fig. 9 shows a cross section of the rectum 25 and the colon 26, in which there is a morbid growth 27. The intestine is cut at the location of the dashed lines 28 and 29. The intervening portion of the affected intestine 27 is removed. Over a distance of some millimetres the layer of muscle is removed from the projecting end 30 of the stump of the colon and prepared so that only the mucosa and sub-mucosa layers 31 project at the end 30.

Fig. 10 shows how the insertion pin 17 together with the seating knob 18, the coupling component 4 with the cylindrical casing 14 which connects with the seating knob 18, and the rounded knob 20 (see fig. 4) are introduced by means of a handle 32' via the rectum to the end 31 of the colon stump.

Fig. 11 illustrates how, around this end of the intestine 30 of the colon stump, a surgical purse suture 32 has already been applied. The rounded knob 20 is then unscrewed and removed, giving the situation shown in fig. 11. Now, as indicated, the end of the extension rod 21 provided with a threaded pin is pushed down into the central aperture 3 of the coupling component 4, the end face 8 of which is recessible, and by twisting of the insertion pin 17 is fastened into the seating knob 18.

As shown in fig. 12, the purse suture 32 is drawn tight and by means of the insertion pin 17 coupling component 4 is drawn up to the seating knob 18, so that the pins 10 are pressed through the mucosa and sub-mucosa layers, and the stump of the colon is drawn tautly upward. The free end 22 of the extension rod 21 now becomes an easily accessible point.

At the other end of the intestine 33 with the prepared bare mucosa and sub-mucosa layers 34, provided with a purse suture 35, the coupling component 1 with the projecting pin 2 is pushed forward, after which the purse suture 35 is drawn tight and attached. The pins 9 then project through the mucosa and sub-mucosa layers.

Subsequently, as shown in fig, 13, the projecting pin 2 of coupling component 1 inserted in the intestine 33 is brought forward

to the end 22 of the extension rod 21 and in the right position pushed thereon. The stop means 23, 24 ensure that the position in relation to the portion of the intestine 30 once selected is maintained. Then manually the end of the intestine 33 is pressed downwards, while at the same time the insertion pin 17 with the components 18 and 21 connected thereto is drawn out of the body.

As shown in fig. 14, the coupling components 1 and 4 with the ends of the intestines 34, 31 folded over the end faces approach each other. As a result of magnetic attraction the device closes up automatically, whilst gripping or clamping the two mucosa ends of the intestine. The pressure from the magnetic force ensures a water and air-tight seal.

As shown in fig. 15, the round end 22 of the extension rod 21 is now loosened from the projecting pin 2 of coupling component 1, which is now firmly connected with coupling component 4. The intestinal suture can now, if required, be supplemented by some stitches at the outside, as shown in figs. 15 and 16.

Fig. 16 illustrates the finally completed intestinal suture.

Fig. 17 illustrates an alternative embodiment of the medical device in accordance with the invention, which corresponds mainly with the embodiment shown in figs. 1-3, wherein, however, the pointed pins 9, 10 and the corresponding apertures 11, 12 have been omitted. The corresponding parts are indicated by the same reference numbers.

As shown by a comparison between fig. 3 and fig. 17, the magnets 5, 6 can now have a larger diameter, so that the cavity in pin 2 can be made larger, thus facilitating improved flow in the intestinal canal. Furthermore, at its end the projecting pin 2 is provided with a rim 36 which projects outwardly. In this end, slots 37 are provided which extend in the longitudinal direction of the pin 2, whereby tongues 38 which can deflect inwards, are provided. The central aperture 3 of the coupling component 4, at some distance from the end face 8, as in the embodiment shown in fig. 3, merges into a broadened portion, the external dimensions of which are greater than those of the rim 36 of pin 2.

If, in order to make a connection between the two coupling components 1, 4, the pin 2 is pushed into the central aperture 3, the tongues 38 are forced inwards until the rim 36 reaches the broadened

portion of the central aperture 3, after which the tongues 38 once again deflect outwards. By this means the coupling components 1, 4 can no longer be easily separated, although the connection force created by the magnets 5, 6 would still be inadequate. The distance from the projecting rim 36 of the pin 2 up to the end face 7 of the coupling component 1 is 2-6 mm, preferably 4 mm, greater than the distance from the broadened portion of the central aperture 3 up to the end face 8 of the second coupling component 4. This means that there is still a space of 2-6 mm between the end surfaces 7, 8, when the rim 36 is located in the broadened portion of the central aperture 3.

Fig. 18 illustrates an embodiment of the coupling component 4 which is particularly suitable for the case when the morbid growth 27 is present in the vicinity of the anus. The coupling component 4 is in this case fastened by means of the end which faces away from its end face 8 to a sheet 39 provided with a layer of adhesive, said sheet 39 being made of a plastic material. The coupling component 4 can now be inserted in the anus, whereby the coupling component is fixed by causing the sheet 39 to adhere to the skin. This ensures that when the closure muscle tightens, the coupling component 4 is not expelled.

The coupling components 1, 4 can consist of an inert plastic material which is extrudable, preferably polyester-polyethylene terephthalate. The magnets 5, 6 are preferably made from polymer-bonded rare earth cobalt alloys, because in the non-magnetised state these materials can be easily machined.

It should be noted that between the magnets 5, 6 and the pin 2, and the central aperture 3, respectively, a groove can also be provided (as indicated schematically in figs. 19a-19e), by means of which the surgical sutures provided at the intestinal extremities are to some extent recessed in the end face 7, 8, respectively. By this means the coupling components 1, 4 in the connected state are brought closer to each other.

Figs. 19a-19e illustrate a particularly favourable alternative embodiment of the ancillary device for the insertion of the coupling components 1, 4. This ancillary device corresponds partially with the ancillary device shown in figs. 4-8, wherein the corresponding parts are denoted by the same reference numbers. In this case, however, the rounded knob 20 can be fastened to the first end 40 of the insertion

pin 17, while seating knob 18 together with the seating 19 forms the front end of a cylindrical sleeve 41 into which the insertion pin 17 can be slidably located. In this embodiment, the initial end 40 of the insertion pin 17 is capable of being pushed into the cavity of the projecting pin 2 of the first coupling component 1. The portion 42 of the insertion pin 17 which proceeds from this end 40 has the same external profile cross section as the pin 2. When employing the embodiment of the coupling components 1, 4 as shown in fig. 17, in order to facilitate the inward movement of the tongues 38, a recessed portion is shaped, denoted by 43, close to the transition from the end 40 to the section 42 of the insertion pin 17.

As shown in fig. 19b, when the coupling component 4 has reached the end of the intestine, the insertion pin 17 can be pushed through the central aperture 3 of coupling component 4 which is located on the seating knob 18, after which the rounded knob 20 can easily be removed. It is now no longer necessary to employ an extension section 21, because it is now no longer possible for the coupling component 4 to become loose from the seating 19, as could otherwise occur under certain conditions with the embodiment in accordance with figs. 4-8, before the extension rod 21 had been applied. The coupling component 4 is now, of course, kept in position by the portion 42 which projects through the central aperture 3. The sleeve 41 and the insertion pin 17 naturally are of such a length that when they reach the end of the colon stump they still project somewhat beyond the body. With this embodiment it is much simpler to attach the coupling components 1, 4 and to make the connection.

If required, the end 40 of the insertion pin 17 can be made in such a way that this end 40 can be detachably fastened in the cavity of the projecting pin 2 of the first coupling component 1. By this means the pin 2 cannot work loose from the insertion pin 17 while the coupling components 1, 4 are being brought together.

The invention is not restricted to the embodiments described above, which can be varied within the scope of the invention in various ways.

PATENT CLAIMS

1. Medical device for connecting two portions of the intestine, consisting of two coupling components which can be connected with each other, which can be inserted in the respective extremities of the two portions of the intestine, and between which - in the coupled state - these intestinal extremities can be clamped, the said coupling components comprising coupling means which are provided with a projecting pin connected with the first coupling component, which pin fits into a continuous central aperture formed in the second coupling component, and fixing means which keep the second coupling component, in the coupled state, pressed against the first coupling component while clamping the intervening ends of the intestine, characterised in that the projecting pin (2) of the first coupling component (1) is made internally hollow with an internal dimension which is at least 1/3 of the external dimension of the first coupling component (1), said cavity traversing the entire coupling component (1), wherein the pin (2) has a sliding fit in the central aperture (3) in the second coupling component (4), while the fixing means consist of magnets (5, 6) which are located in the parts of the coupling components (1, 4), which face each other in the coupled state, adjacent to the projecting pin (2) in the first coupling component (1), and adjacent to the central aperture (3) in the second coupling component (4), respectively.

2. Medical device according to claim 1, characterised in that the coupling components (1, 4) are rotational-symmetrical.

3. Medical device according to claim 1 or 2, characterised in that the two coupling components (1, 4) are rings with a cylindrical external surface (13, 14) and the same ring dimeter.

4. Medical device in accordance with one of claims 1-3, characterised in that the magnets (5, 6) are ring-shaped with an external diameter equal to or less than the external diameter of the corresponding coupling component (1, 4) and with an internal diameter larger than the largest pin diameter.

5. Medical device in accordance with one of claims 1-4, characterised in that the magnetic material of the magnets (5, 6) is located in or adjacent to the end faces (7, 8), which face each other in the

coupled state, of the two coupling components (1, 4), while the axial length of the coupling components (1, 4) is greater than the thickness of the magnets (5, 6).

6. Medical device according to claim 5, characterised in that apertures (15, 16) are recessed in the magnet-free portion of the cylindrical casing of the coupling components (1, 4) which face away from the end faces (7, 8).

7. Medical device in accordance with one of the preceding claims, characterised in that the pin (2) and the central aperture (3) have such a profile that the central aperture of the second coupling component (4) can be pushed over the pin (2) of the first coupling component (1) without rotation around its axis occurring.

8. Medical device according to claim 7, characterised in that the external profile cross section of the pin (2) and the internal profile cross section of the central aperture (3) have the form of a regular polygon, especially a hexagon.

9. Medical device in accordance with one of the preceding claims, characterised in that pointed pins (10) are incorporated at a short distance from the circumference and vertical to the end face (8) of the second coupling component (4), while corresponding recesses (11) are formed in the end face (7) of the first coupling component (1).

10. Medical device according to claim 9, characterised in that the two coupling components (1, 4) are provided both with pointed pins (9, 10) and with recesses (11, 12).

11. Medical device in accordance with one of the preceding claims, characterised in that at its end the pin (2) is provided with a rim (36) which projects outwards, while longitudinal grooves (37) are provided at this end, wherein the central aperture (3) in the coupling component (4) at some distance from the end face (8) has a broadened portion, the dimension of which is greater than that of the pin (2), while the distance from the projecting rim of the pin (2) to the end face (7) of the first coupling component (1) is 2-6 mm greater than the said distance from the broadened portion of the central aperture (3) to the end face (8) of the second coupling component (4).

12. Medical device in accordance with one of the preceding claims,

characterised in that the second coupling component (4) is fastened to a sheat (39) provided with an adhesive layer and made from a plastic material.

13. Medical device in accordance with one of the preceding claims, characterised in that the coupling components (1, 4) consist of an inert plastic material which can be extruded.

14. Medical device according to claim 13, characterised in that the plastic material is polyester-polyethylene terephthalate.

15. Medical device in accordance with one of the preceding claims, characterised in that the magnets are made from polymer-bonded rare earth cobalt alloys.

16. Ancillary device for use with a medical device in accordance with one of the preceding claims 3-15, characterised by a seating knob (18), on which the end of the second coupling component (4) facing away from the end face (8) can be located, and a knob (20), which is rounded at the front end which can be placed on the end face (8) of the second coupling component (4), wherein - in the assembled state- the seating knob (18), the second coupling component (4) and the knob (20) form a continuous cylinder and - in the assembled state - can be introduced into a portion of the intestine in the body of the patient by means of an insertion pin (17).

17. Ancillary device according to claim 16, characterised in that the knob (20) can be fastened to the seating knob (18) with the second coupling component (4) therebetween.

18. Ancillary device according to claim 17, characterised in that an extension rod (21) can be attached to the seating knob (18), said extension rod (21) having the same external profile cross section as the projecting pin (2) of the first coupling component (1) and one end (22) of which can be inserted in the cavity of the pin (2), wherein stop means (23, 24) are provided for fixing the right mutual position of the pin (2) and the extension rod (21).

19. Ancillary device according to claim 16, 17 or 18, characterised in that the seating knob (18) can be fastened by means of a screw thread connection to the end of the insertion pin (17).

20. Ancillary device according to claims 17 and 18, characterised

in that the knob (20) and the extension rod (21) can be fastened by means of a screw thread connection to the seating knob (18).

21. Ancillary device in accordance with one of claims 16-20, characterised in that the knob (20) which is rounded at the top is provided at its underside with a concentric groove in the end face at a small distance from the periphery, having a depth which is at least as great as the pointed pins (10) which project from the end face (8) of the coupling component (4).

22. Ancillary device according to claim 16, characterised in that the rounded knob (20) can be attached to a first end (40) of the insertion pin (17), wherein the seating knob (18) forms the front end of a cylindrical sleeve (41) in which the insertion pin (17) can be slid, so that the insertion pin (17) can be pushed through the central aperture (3) of the coupling component (4) located on the seating knob (18).

23. Ancillary device according to claim 22, characterised in that the first end (40) of the insertion pin (17) can be pushed into the cavity of the projecting pin (2) of the first coupling component (1), wherein a portion of the insertion pin (17) which extends from this end has the same external profile cross section as the pin (2).

24. Ancillary device according to claim 23, characterised in that stop means are provided for fixing the right mutual position of the pin (2) and the insertion pin (17).

25. Ancillary device according to claim 22, 23 or 24, characterised in that the first end of the insertion pin (17) is detachably fastenable in the cavity of the projecting pin (2) of the first coupling component (1).

26. Procedure for making an intestinal suture with the aid of a medical device in accordance with one of claims 1-16, characterised in that after resection of the intestine the mucosa and sub-mucosa are separated from the surrounding layer of muscle which is removed over a distance of several millimetres, after which the coupling components (1, 4) are applied in the ends of the intestine and only the mucosa and sub-mucosa layers are clamped between the two coupling components (1, 4).

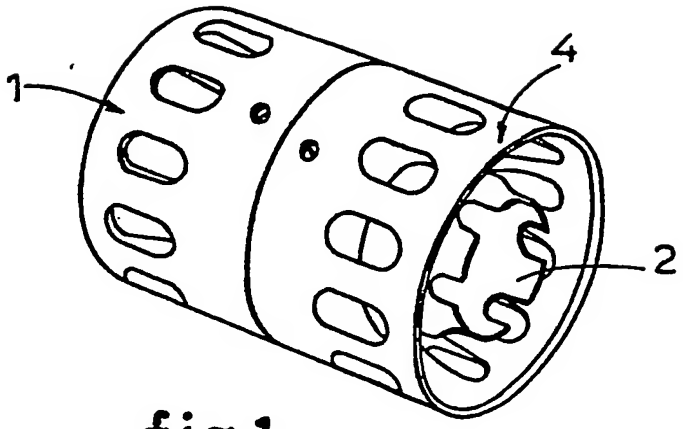


fig.1

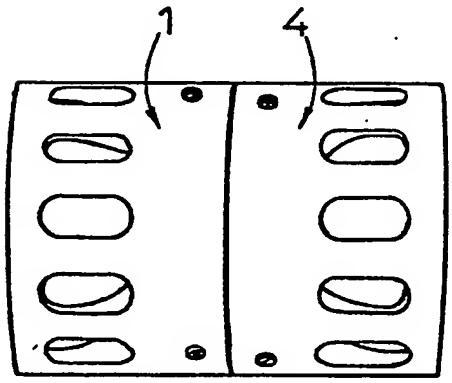


fig.2

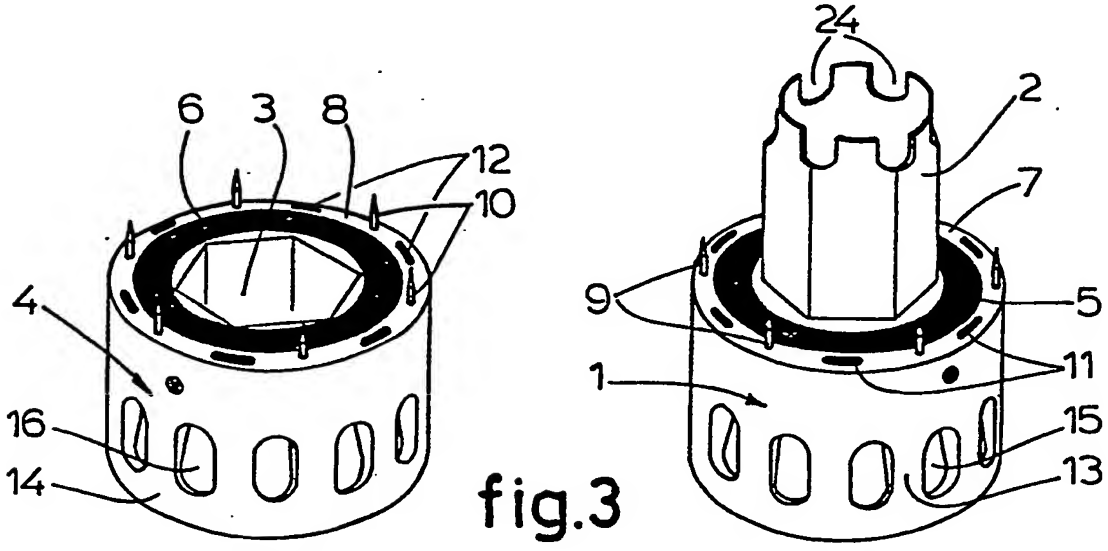


fig.3

(a) (b)

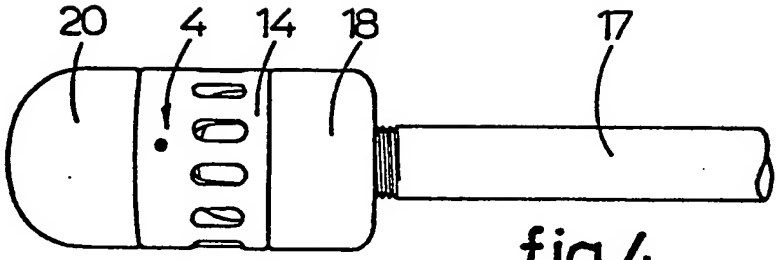


fig.4

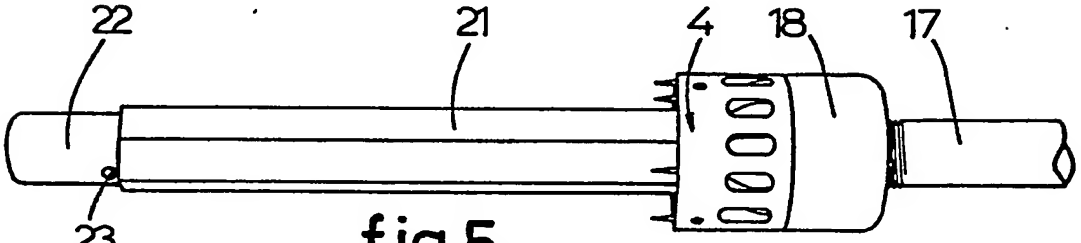


fig.5

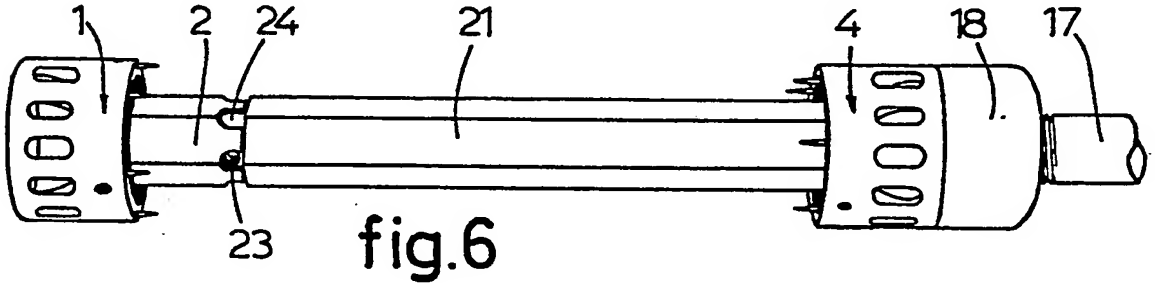


fig.6

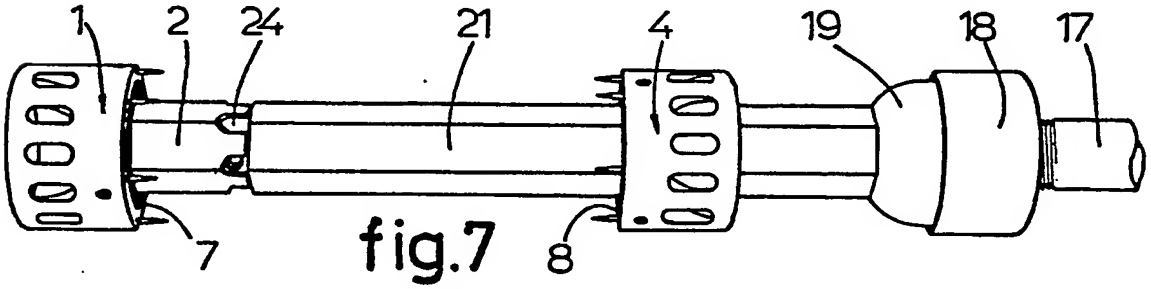


fig.7

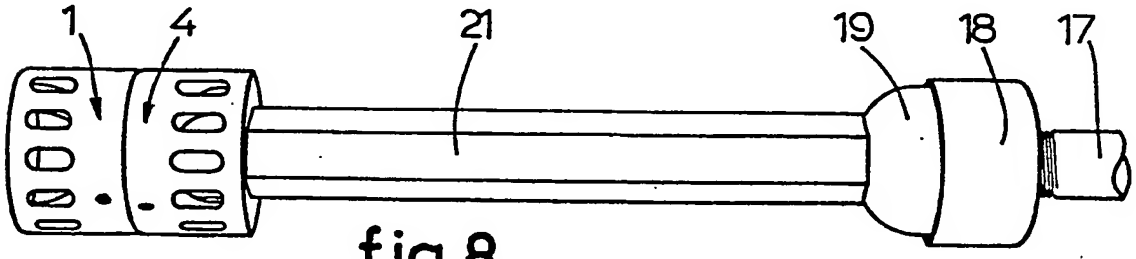


fig.8

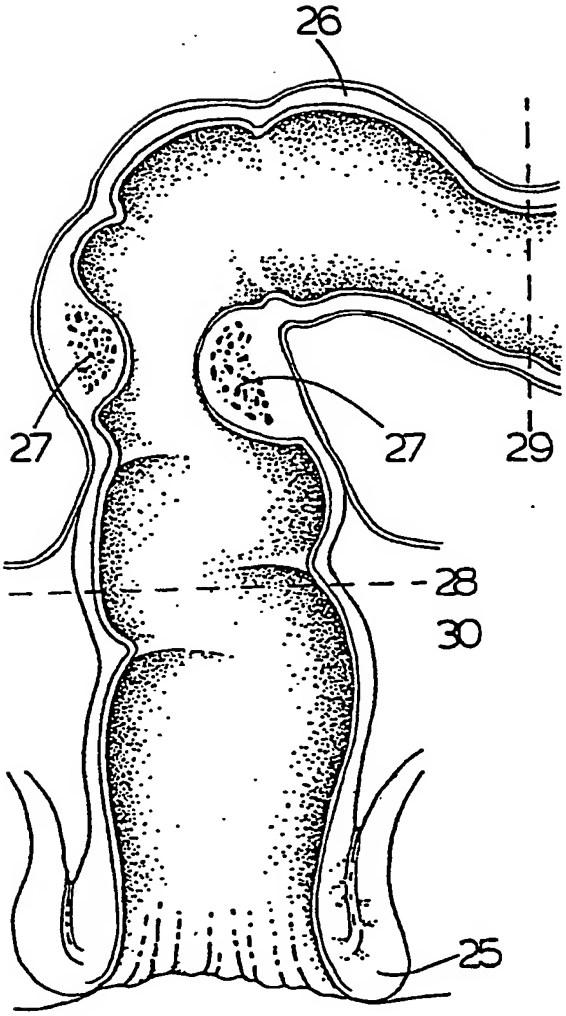


fig.9

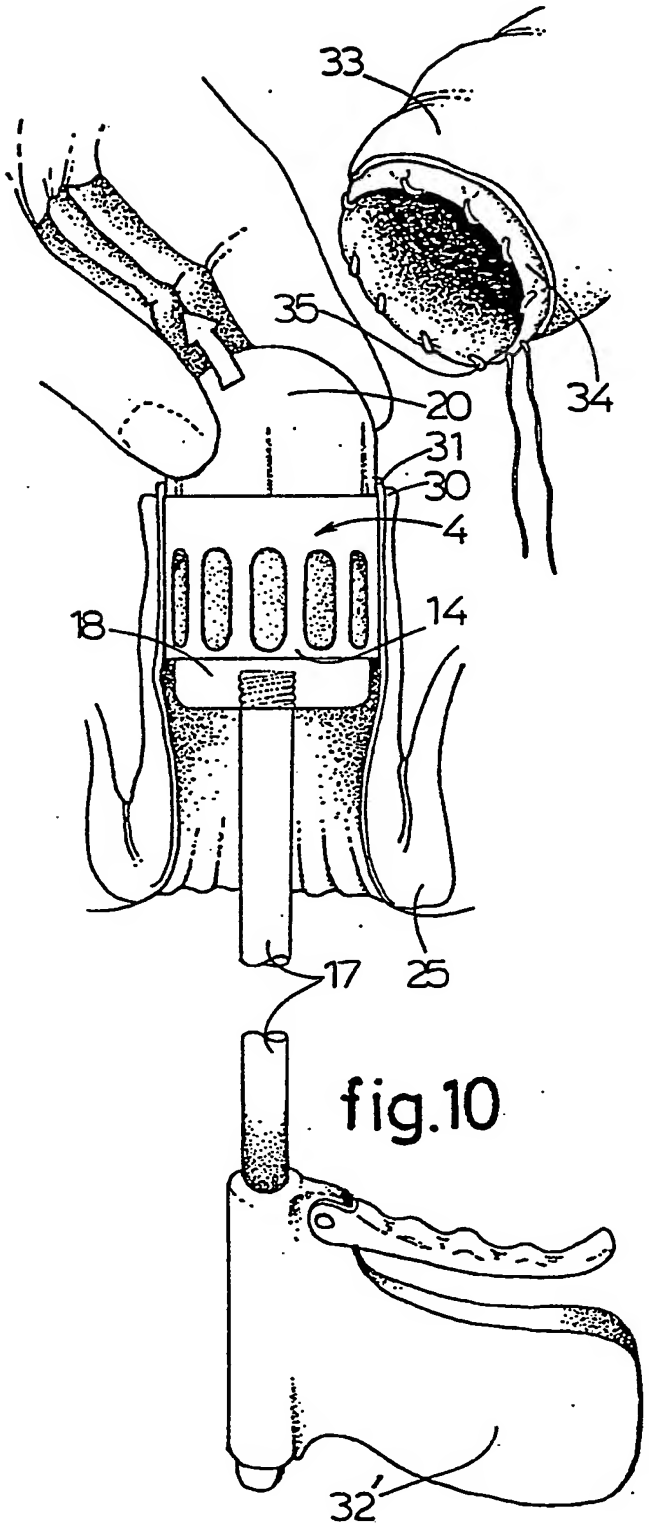


fig.10

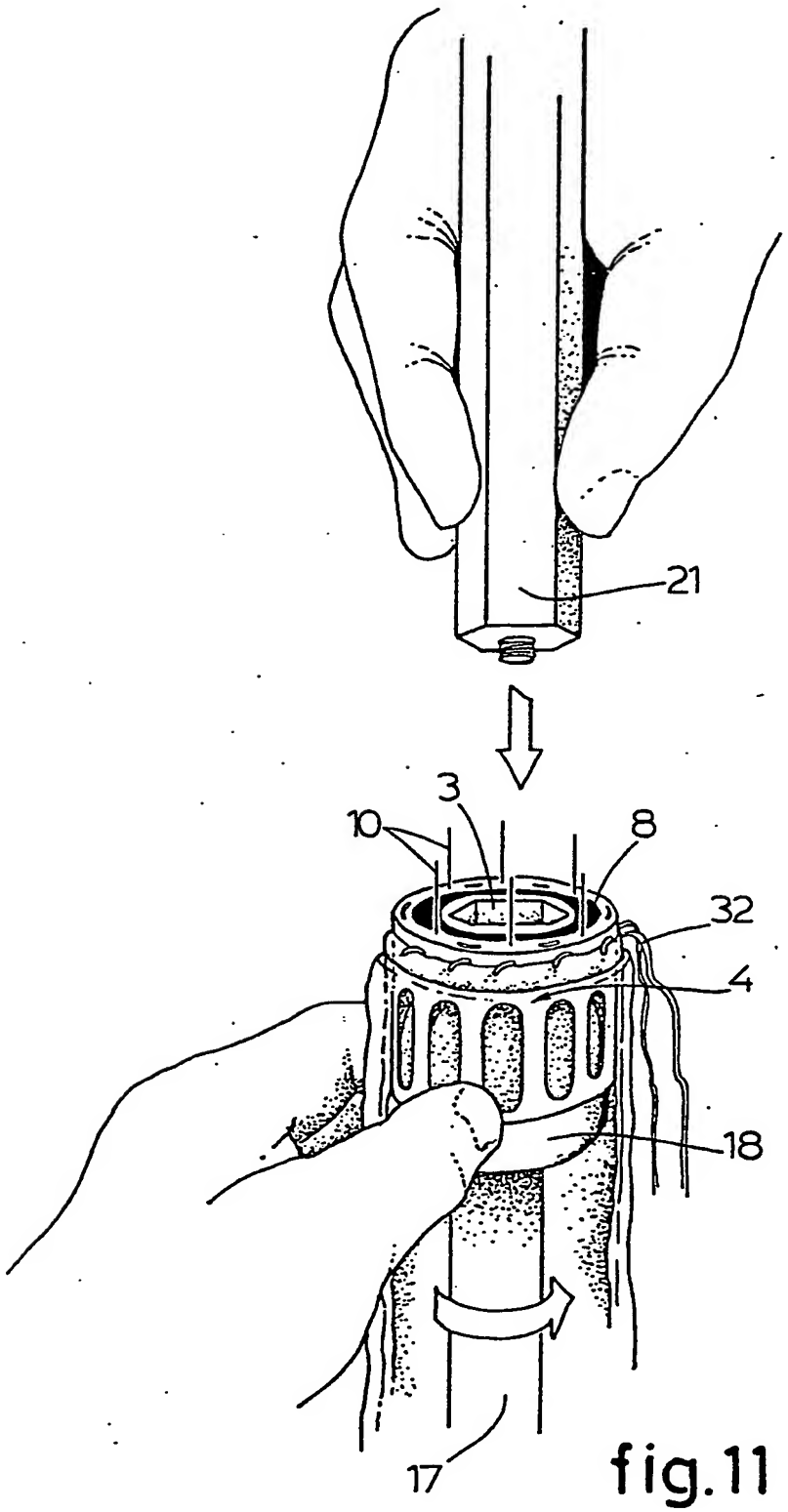


fig.11

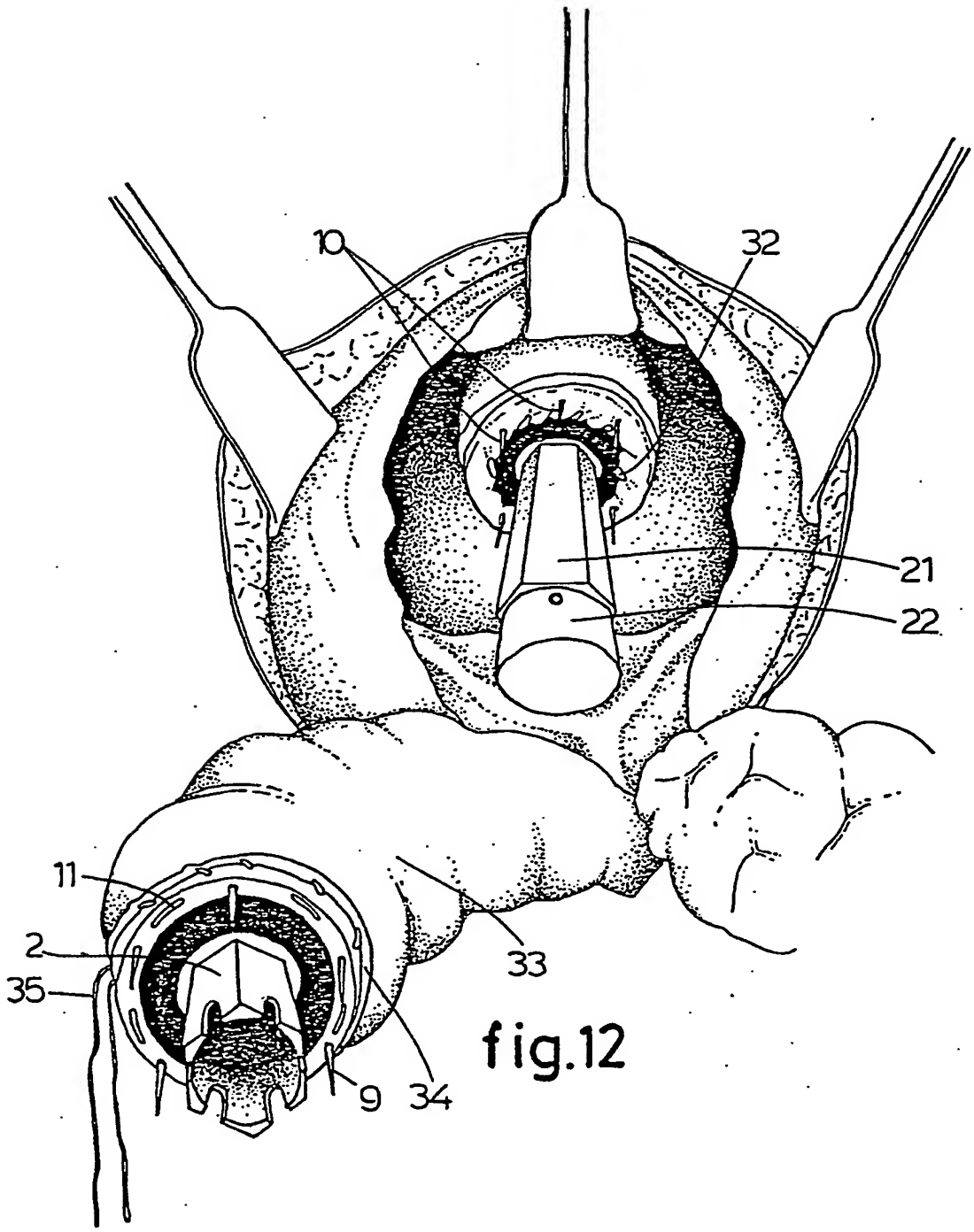


fig.12

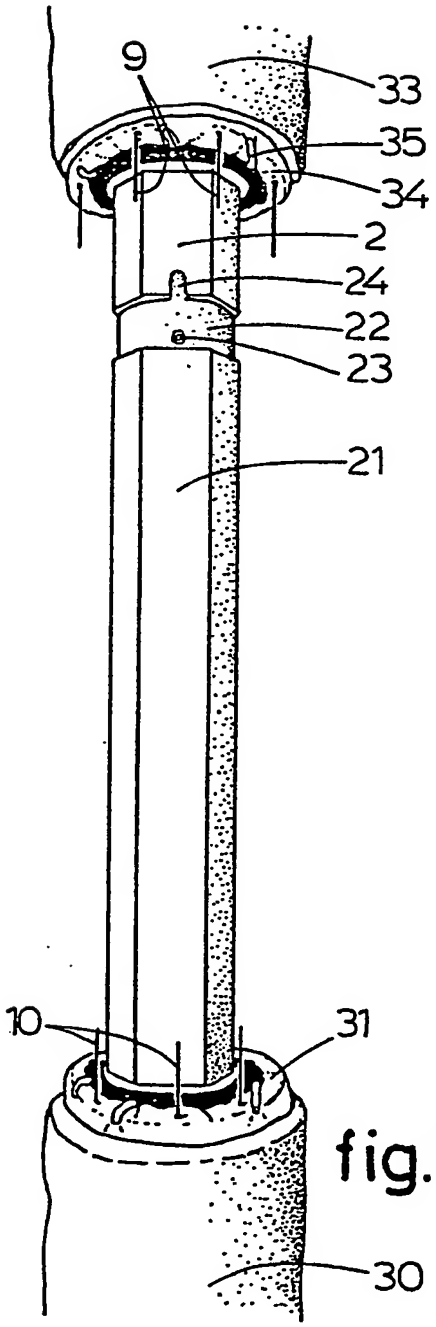


fig.13

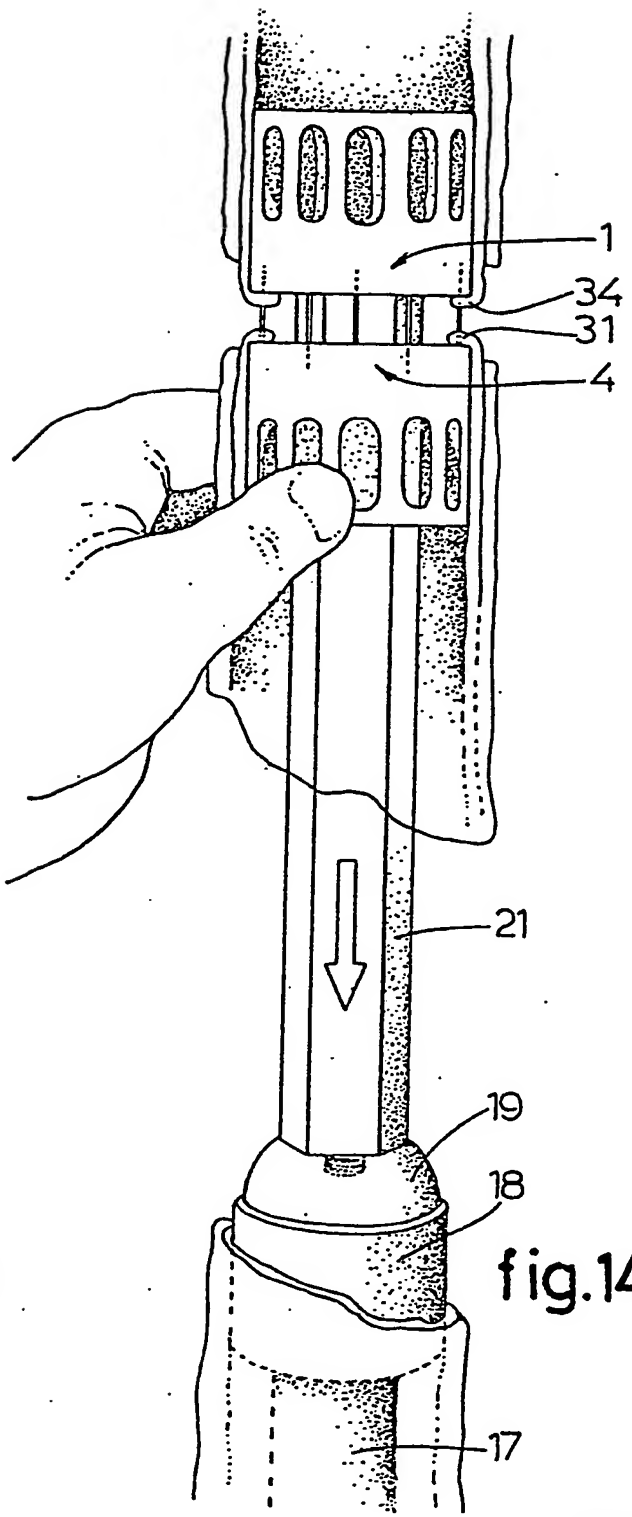


fig.14

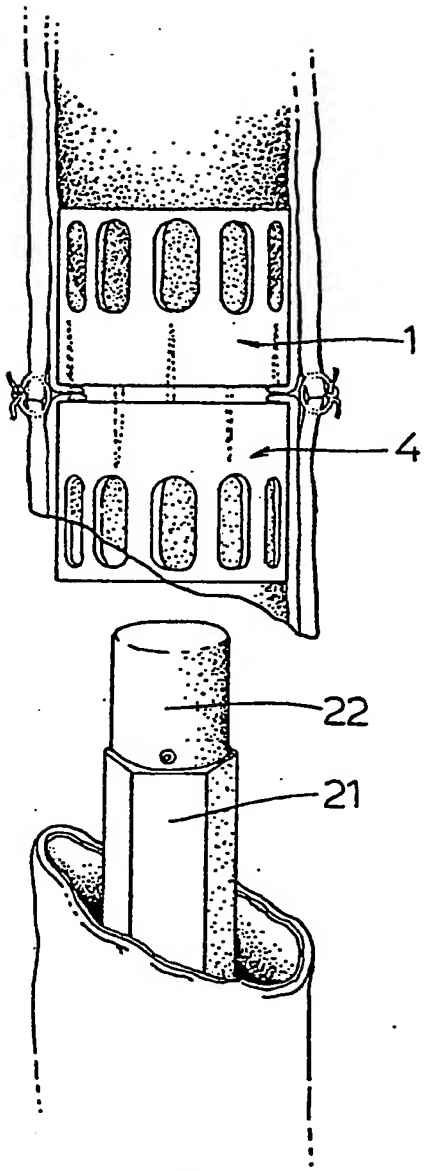


fig.15

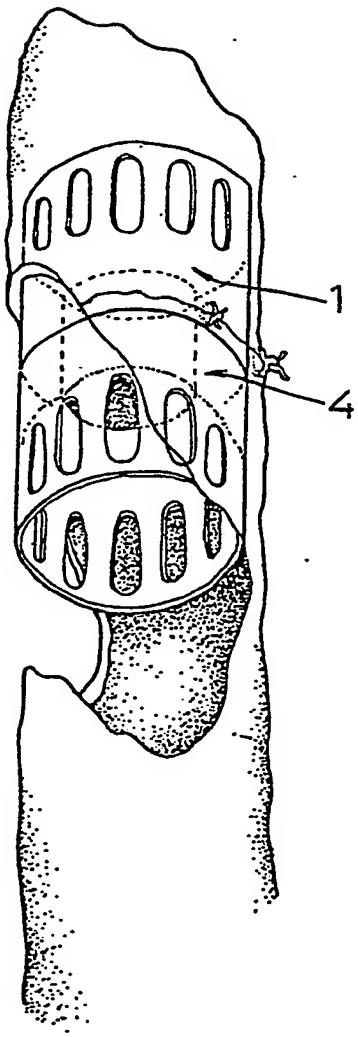
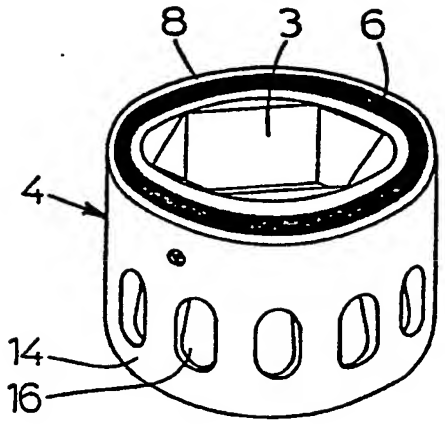
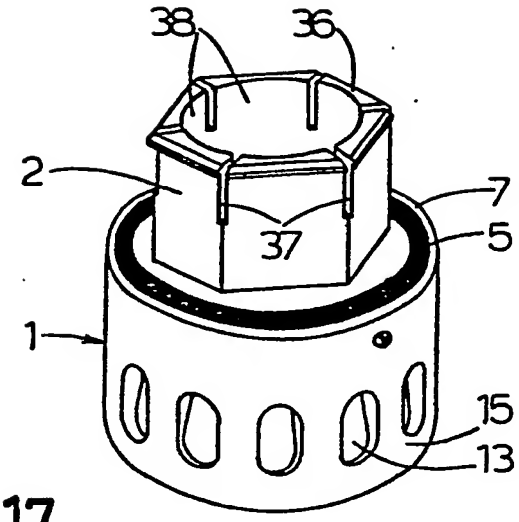


fig.16



(a)



(b)

fig.17

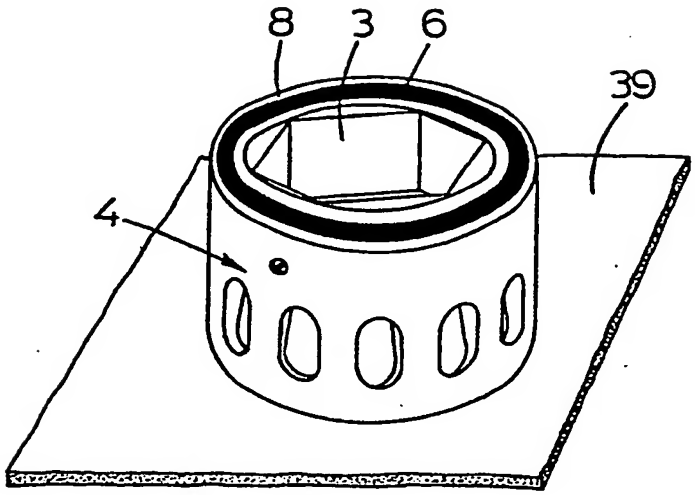
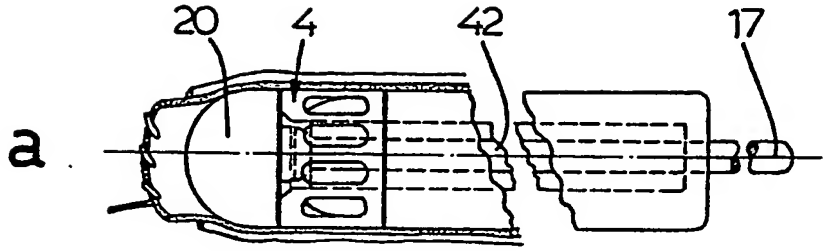
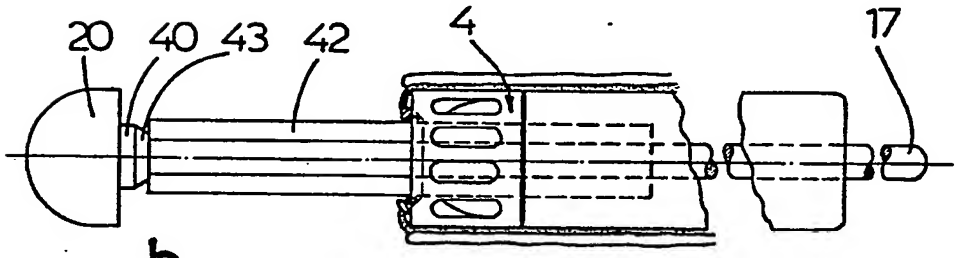


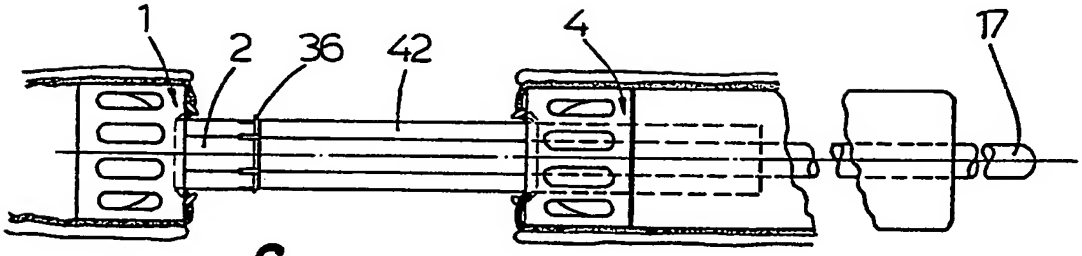
fig.18



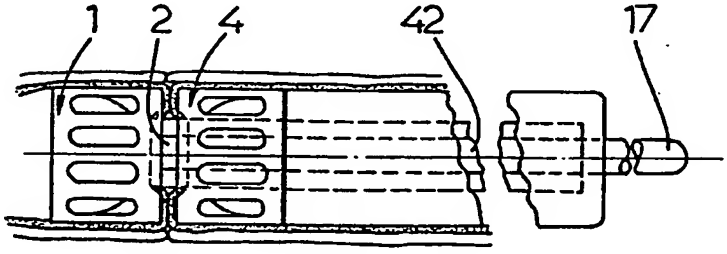
a



b

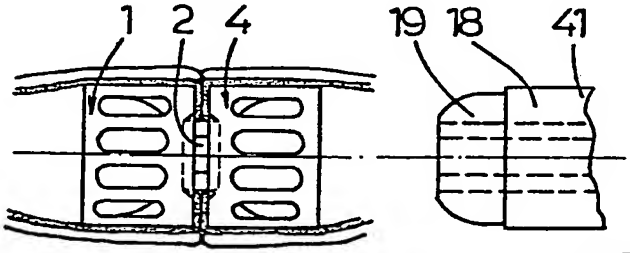


c



d

fig.19



e

INTERNATIONAL SEARCH REPORT

International Application No PCT/NL 80/00029

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) 3

According to International Patent Classification (IPC) or to both National Classification and IPC

Int.Cl.[3] A 61 B 17/11

II. FIELDS SEARCHED

Minimum Documentation Searched 4

Classification System	Classification Symbols
Int.Cl.[3]	A 61 B

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched 5

III. DOCUMENTS CONSIDERED TO SE RELEVANT 14

Category *	Citation of Document, 16 with indication, where appropriate, of the relevant passages 17	Relevant to Claim No. 18
X	NL, A, 7400096, published July 8, 1975, see pages 1 to 5, figure 1, Kluvers	1-5,9-11, 13,26
	US, A, 3552626, published January 5, 1971, see column 3, lines 3 to 55, figure 2, Astafiev	16,18-19

* Special categories of cited documents: 15

"A" document defining the general state of the art

"E" earlier document but published on or after the international filing date

"L" document cited for special reason other than those referred to in the other categories

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but on or after the priority date claimed

"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention

"X" document of particular relevance

IV. CERTIFICATION

Date of the Actual Completion of the International Search 3	Date of Mailing of this International Search Report 3
December 16, 1980	December 23, 1980
International Searching Authority 1	**Signature of Authorized Officer 20**
European Patent Office	G.L.M. KRUYDENBERG

Form PCT/ISA/210 (second sheet) (October 1977)